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ART UNIT	PAPER NUMBER
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/781,354	DICKEN, VOLKER	
	Examiner	Art Unit	
	DANIEL F. HAJNIK	2628	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 June 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *24-39* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *24-39* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *17 February 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *6/19/2008*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 6/19/2008 has been entered.

Claim Rejections - 35 USC § 101

1. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 35 and 36 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. That is, the claims are directed to a computer program product comprising "program means". The claim overall is directed towards a data structure, per se. Data structures not claimed as embodied in computer-readable media are descriptive material per se and are not statutory because they are not capable of causing functional change in the computer. Such claimed data structures do not define any structural and functional interrelationships between the data structure and other claimed aspects of the invention which permit the data structure's functionality to be realized.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 24-29, 32, 33, and 35-38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Payne et al. (NPL Doc, "Distance Field Manipulation of Surface Models") in view of Gering (NPL Doc, "A System for Surgical Planning and Guidance ...").

As per claim 24, Payne teaches the claimed:

24. A method of visualizing a curved layer of a body *(on page 65 in the first paragraph, "Scientific visualization frequently gives rise to complex models of surfaces. In biomedical imaging, organs such as the brain provide elaborate structures to image and analyze" where a complex surface model includes curved layers)*, which comprises:

providing volumetric data, the volumetric data having first voxels belonging to a reference surface *(top of 2nd col on page 66, "Step one is computing the distance field from input surface models" where the input surface model is a reference surface; middle of 1st col on page 66, "Raya and Udupa used voxel models' distance fields to interpolate structures in two and three dimensions", and the bottom of the 1st col on page 66, "1. Compute a distance field over a 3D sampling lattice from the given surface or surfaces" where the sampling lattice is voxel data)*;

"determining second voxels of the volumetric data" from the reference surface *(in figure 2 where the caption states "We produced this surface ... as an offset of the outer transparent surface"; in this case, the surface produced is the second voxels of the volumetric data and the surface produced is a given distance from the outer reference surface; in this instance, the given distance is the offset).*

visualizing the second voxels by orthogonal or perspective projection *(in figure 2 where the figure shows a perspective projection because it shows the data from a given view or perspective).*

Payne does not explicitly teach the remaining claim limitations because in figure 2 Payne does not elaborate on whether the offset distance is user selected.

Gering teaches the claimed:

a user selected distance *(bottom of page 41, "we allow the slice planes to selectively clip away the skin model to reveal other unclipped models beneath" where this selectively clipping away is a distance)*;

It would have been obvious to one of ordinary skill in the art at the time of invention to Payne and Gering in order to improve the usability of the system by giving the user more control over the offset of surface removal. Payne is modified by Gering by applying the selective clipping and distance controls of Gering to the surface removal operation as described on page 68 and shown in figure 2 of Payne.

As per claim 25, Payne does not explicitly teach the claimed limitations.

Gering teaches the claimed:

25. The method of claim 24, which further comprises segmenting the volumetric data to identify the first voxels. *(in figure 2-5 where segmenting is performed).*

It would have been obvious to one of ordinary skill in the art at the time of invention to utilize the segmenting as taught by Gering with the teachings of Payne in order to more quickly identify anatomical structures in image data.

As per claim 26, Payne does not explicitly teach the claimed limitations.

Gering teaches the claimed:

26. The method of claim 24, wherein the user selected distance of each one of the second voxels from the reference plane is determined along a direction of projection *(in figure 3-2 on page 62 where distance is specified using trajectory planning, in this instance, the distance is from the entry to the target point (see figure caption), and the distance is along a direction of projection).*

It would have been obvious to one of ordinary skill in the art at the time of invention to select along a direction of projection as taught by Gering with the teachings of Payne. The motivation of claim 1 is incorporated herein.

As per claims 27 and 28, Payne does not explicitly teach the claimed limitations as applied to user selected distances per se.

However, Payne suggests the claimed:

27. The method of claim 24, wherein the user selected distance of each one of the second voxels from the reference surface is determined by a minimum distance measure *and*

28. The method of claim 27, wherein the minimum distance measure is a Euclidean distance *(in the middle of the 1st col on page 67, "Euclidean distance calculation ... minimum squared distance").*

It would have been obvious to one of ordinary skill in the art at the time of invention to generate the Euclidean distance and apply it to the user selected distance in order to better establish distance measurements based on straight line calculations. Payne is modified to use the claimed distance measure by applying the Euclidean distance as mentioned in Payne to the user selected distance of Gering for calculation in the multi-dimensional coordinate system.

As per claim 29, Payne teaches the claimed:

29. The method according to claim 24, wherein:

the volumetric data is medical image data *(in figure 2 where medical image data is shown)*; and

the reference surface is a body-region surface *(in the 1st paragraph of page 65, "organs such as the brain provide elaborate structures to image and analyze").*

As per claim 32, Payne does not explicitly teach the claimed limitations.

Gering teaches the claimed:

32. The method according to claim 29, wherein the body-region surface is a surface of a pathological structure *(in figure 2-10 where the tumor is a pathological structure).*

It would have been obvious to one of ordinary skill in the art at the time of invention to analyze the pathological structure as taught by Gering with the teachings of Payne because CT data analysis of tumors is useful and helpful for diagnosing and surgical planning.

As per claim 33, Payne does not explicitly teach the claimed limitations.

Gering teaches the claimed:

33. The method of claim 24, wherein the volumetric data is three-dimensional microscopy data *(page 76, section 4.3.3, "The key in this application is that the lesion is benign, small, and difficult to find ... The 3D Slicer can significantly reduce risk of damage by guiding the surgeon more directly toward small lesions" where the small lesions are microscopy data on the volumetric display).*

It would have been obvious to one of ordinary skill in the art at the time of invention to utilize the microscopy data as taught by Gering with the teachings of Payne. Gering teaches one advantage to the combination (*page 76, section 4.3.3, "The key in this application is that the lesion is benign, small, and difficult to find ... The 3D Slicer can significantly reduce risk of damage by guiding the surgeon more directly toward small lesions").*

As per claims 35-38, these claims are similar in scope to claims 24, 25, 24, and 25, respectively, and thus are rejected under the same rationale.

the reasons and rationale for the rejection of claim 1 is incorporated herein.

3. Claim 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over Payne et al. (NPL Doc, "Distance Field Manipulation of Surface Models") in view of Gering (NPL Doc, "A System for Surgical Planning and Guidance ...") in further view of Vining (US Patent 6,083,162).

As per claim 30, Payne does not explicitly teach the claimed limitations.

Vining teaches the claimed:

30. The method according to claim 29, wherein said volumetric data is a thorax CT scan *(in the abstract, "CT images" and col 18, lines 60-65 "FIG. 15, a selected subvolume 214 is depicted containing the entire tracheobronchial airways. The bronchial airways are isolated from the entire thorax").*

It would have been obvious to one of ordinary skill in the art at the time of invention to combine Payne, Gering, and Vining in order to expand the total available types of treatment with the CT analysis system of Payne. Payne is modified by Vining by substituting the brain volumetric data of Payne with the CT thorax data of Vining.

4. Claims 31 and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Payne et al. (NPL Doc, "Distance Field Manipulation of Surface Models") in view of Gering (NPL Doc, "A System for Surgical Planning and Guidance ...") in further view of Novak et al. (US Pub 2002/0028006).

As per claim 31, Payne does not explicitly teach the claimed limitations.

Novak teaches the claimed:

31. The method according to claim 29, wherein the body-region surface is a surface of a lung *([0050], "Volumetric data ... for a set of the lungs is loaded").*

It would have been obvious to one of ordinary skill in the art at the time of invention to combine Payne, Gering, and Novak. Utilizing the lung data of Novak allows for detection and diagnosis of lung nodules ([0065]). Payne is modified by Novak by substituting the brain volumetric data of Payne for the lung volumetric data of Novak.

As per claim 39, Payne does not explicitly teach the claimed limitations.

Novak teaches the claimed:

39. The computer system of claims 37, further comprising user interface means for entering the user selected distance, the user interface means preferably including a wheel mouse or virtual slider, an amount of rotation of the wheel of the wheel mouse or a slider position being indicative of the user selected distance *([0050], "Step 110 may be performed, for example, using the mouse ... Clicking on a sliding bar ... to move up and down or to jump to a certain slice").*

It would have been obvious to one of ordinary skill in the art at the time of invention to utilize the sliding bar as taught by Novak with the teachings of Payne in order to make the controls on the system more intuitive and easier to use.

5. Claim 34 is rejected under 35 U.S.C. 103(a) as being unpatentable over Payne et al. (NPL Doc, "Distance Field Manipulation of Surface Models") in view of Gering (NPL Doc, "A System for Surgical Planning and Guidance ...") in further view of Pfister et al. (NPL Doc, “Cube-3: a real-time architecture for high-resolution volume visualization”).

As per claim 34, Payne does not explicitly teach the claimed limitations.

Pfister teaches the claimed:

34. The method of claim 24, which further comprises:

including a two dimensional slice in the volumetric data *(in figure 3) and*

pre-processing the volumetric data in a reformatting step *(in figure 3)*, the reformatting step including: *and*

moving all of the first voxels of the reference surface to a common row *(in figure 3)*, and

moving the voxels lying outside the reference surface within the slice such that respective distances from the reference surface remain constant and such that all of the first voxels that are equidistant to the reference surface are moved into a common row of the slice *(in figure 3)*; and

visualizing the second voxels by generating an image for the voxels within common row positions in parallel slices *(in figure 3).*

For example, see the following example comparison using figure 3 of Pfister:

Applicant's Invention

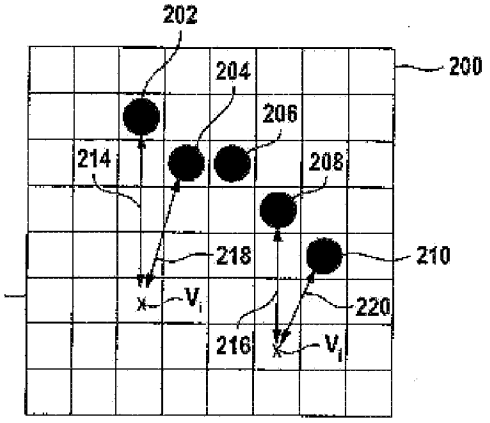

Fig. 2

Prior Art (Pfister)

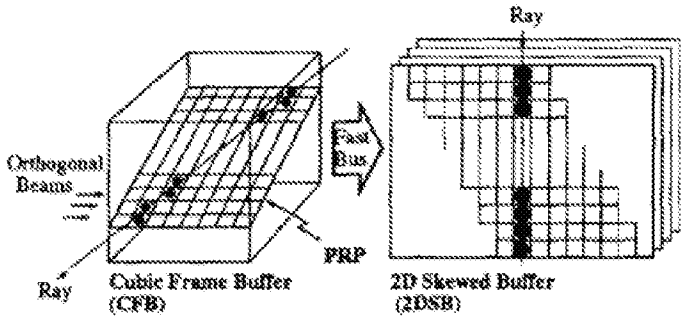

Figure 3: Arbitrary Viewing Mechanism.

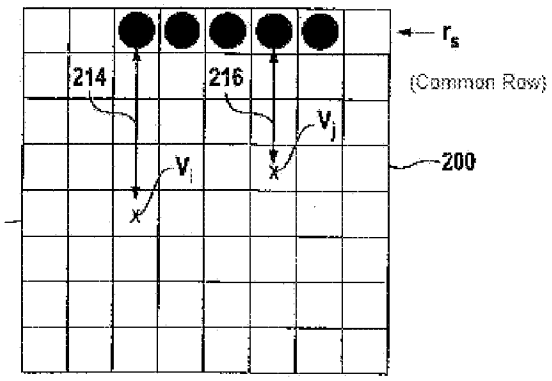

Fig. 3

The images on left show the common row from slice data as demonstrated in the current invention. The images on the right from Pfister shows these voxels reformatted in respect to the common row. In this instance, the distances to other voxels in Pfister remain the same before and after reformatting in respect to the common row. Also, figure 3 of Pfister shows the claimed visualization.

It would have been obvious to one of ordinary skill in the art at the time of invention to combine Payne, Gering, and Pfister. Gering and Payne are modified by incorporating the arbitrary viewing mechanism for volumes in figure 3 of Pfister into the voxel reformatting process of Gering in section 2.3.1 on page 32. This will allow the reformatting voxels of Gering to establish a common row as shown in figure 3 of Pfister. One advantage to the combination is to reorient the voxel data for a given perspective in order to make the voxel data easy to calculate and manipulate after re-orientation. This is achieved because the voxel data after reformatting is better organized in respect to a given viewpoint. Thus, it would be easier to pan the image data horizontally or vertically left or right when it is formatted as shown in figure 3 in the figure on the right.

Response to Arguments

1. Applicant's arguments filed 6/19/2008 have been fully considered but they are not persuasive.

Applicant remarks that the claimed invention is different and novel, and provides exhibit A for support (bottom of page 6 to bottom of page 7).

The examiner appreciates applicant's submission of their exhibit and their efforts to help explain their invention. The examiner further has fully reviewed applicant's remarks in regards to Views A and B of exhibit A. Unfortunately however, in this instance, the examiner respectfully believes the rejection statement is proper because, exhibit A shows some similarities between the claimed invention and the primary reference of Payne. For example, view A shows that the

second voxels are displaced a given distance in respect to the reference surface also shown in view A. This concept is similar to the distance fields as explained in Payne. For example, Payne on page 68, shows the capability to offset surfaces based upon another given surface (also see the caption of figure 2 on page 68.) The top of the 2nd col on page 68, states "Here the cutaway is one or more curved surfaces determined by the shape of the object itself". This appears to be the same concept as shown in view A where the second voxels are based upon the shape of the reference surface.

Applicant argues:

In contrast to the invention, the images provided by the surface manipulation techniques devised in the prior art provide three-dimensional rendering of such surfaces. The invention as claimed provides a flat, two-dimensional image of a curved layer of a body which in reality goes through various slices of the original volumetric data.

(middle of page 8 in filed response).

The examiner respectfully maintains that the rejections are proper in this case because in relation to claim 24, the claim language does not specify all the details of the visualization as argued by applicants. For example, applicants refer to a flat, two-dimensional image. However, at the current time, such language is not present in claim 24. In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., a flat, two-dimensional image) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the

specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

In addition, applicants do claim the two-dimensional image in claim 34. However, in this office action, the reference of Pfister is relied upon in claim 34 for showing the two-dimensional flat image. Pfister shows this feature in figure 3 on the right in the "2D Skewed Buffer". This two-dimensional image is the result of a perspective projection (see 1st paragraph under section 3.2).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daniel F. Hajnik whose telephone number is (571) 272-7642. The examiner can normally be reached on Mon-Fri (8:30A-5:00P).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ulka J. Chauhan can be reached on (571) 272-7782. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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